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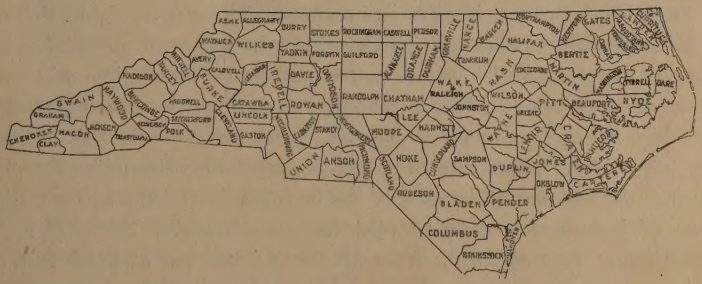
AGRICULTURAL EXTENSION SERVICE

B. W. KILGORE, Director

Soybeans--A Future Economic Factor in North Carolina



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SOYBEANS: A FUTURE ECONOMIC FACTOR IN NORTH CAROLINA.

By C. B. Williams, Chief, Division of Agronomy.

Since the introduction of soybeans in North Carolina more than one-third of a century ago, the acreage devoted to this crop has steadily increased, particularly in the eastern part of the State. Here they are most intensively grown at the present time. Notwithstanding the fact that this year there has been a material increase in the acreage devoted to this crop throughout the State, it has not been nearly as great as the importance of the crop justifies. As a general thing, North Carolina farmers, and Southern farmers generally, have not learned to fully appreciate the value of the soybean. This applies even to those who have grown them to a more or less extent, and especially has this been true up until the last few years.

Since the coming of the cotton-boll weevil into Texas in 1892, those farmers whose fields were infested as well as those located further north in unaffected areas but into which it was felt the boll weevil would soon come, have been casting about to determine what crop might be substituted for cotton in part or in whole. There is no doubt that the coming of this pest into North Carolina will lead to a material reduction in the acreage devoted to cotton and at the same time will force most growers to devote more attention to rational systems of rotation in which cotton may or may not enter. Such practice will lead in many cases to a larger production of cotton per acre notwithstanding the presence of the boll weevil, because of the bringing in and the better utilization of leguminous crops adapted for growth under North Carolina conditions. It would seem from all the information at hand that for summer growing, soybeans is one of the most promising legumes that may be used throughout most of the State and the South generally.

SOYBEANS VERSUS COWPEAS.

It has been found, generall, that soybeans are better yielders than cowpeas when planted in rows and cultivated. They also are a more certain crop for hay and for seed purposes than are cowpeas; not only

s this true on well-drained soils, but also on those which are *fairly* ell drained. Especially is this so after the crops are well under way. n black soils, it has been found that the soybeans will usually thrive hen efforts put into the growth of cowpeas on such soils many times eet with failures or with very poor returns at the best.

Fig. 1.—Soybeans grown in rows for seed and soil-improving purposes.

In sections of the State where, during the late spring and early fall, e nights are cool, the soybean will be found to be much better adapted, nerally, than the cowpeas. Soybeans, either young or old, will stand ht frost and keep on growing, while the least touch of cold frosty ather will nip cowpea vines and stop their growth. For these reasons ybeans may be sown earlier in the spring and be expected to grow er in the fall than cowpeas. This is of special interest and value to se whose farms are located under conditions requiring crops that ll thrive with cool nights and complete their growth in a compara- ely short period, as will be found to be the case with the earlier turing strains like the Wilson, Haberlandt, Virginia, and Austin.

Under most conditions favorable to the growth of soybeans, this crop ll produce a larger yield of seed than will cowpeas. In most cases production of total growth, too, will be equal or greater. The cost growing the two crops in rows will be found to be practically the ne, or a little in favor of the beans because of their ease of cultiva- n due to their upright habit of growth.

SOYBEANS VERSUS PEANUTS.

Soybeans have a much wider range of adaptability than peanuts. Peanuts, like cowpeas, are not able to stand the least bit of frost; in fact, where cool nights prevail during the last of spring and early fall, peanuts will not usually be found to thrive very well, as they, like cowpeas, are very sensitive to cool weather.

FIG. 2.—Soybeans drilled in corn rows.

Again, peanuts do not have the range of adaptability to soils that soybeans and cowpeas have. They do not usually do their best on clay or black soil.

The soybean will produce 50 to 100 per cent greater growth of vines than will peanuts when grown under the same conditions favorable to both crops. Peanuts, on the other hand, in most cases, will produce a larger yield of nuts in the hull than soybeans will produce clean seed. Ordinarily, a piece of land suited to the growth of both of these crops when yielding 20 to 25 bushels of soybeans, will produce about 40 bushels of Spanish peanuts in the hull.

Soybeans are much more easily cultivated than are peanuts, particularly so after the first cultivation, because the vines of peanuts are

nore or less running, while soybeans of the varieties generally used re upright in habit of growth. To harvest peanuts it will cost double o triple the amount it will cost to harvest soybeans. With a suitable nachine pulled by a team of mules or horses and operated by two men, omething like 5 to 6 acres of beans may be harvested in a day. When uch a machine is not available and the vines have to be cut with a

FIG. 3.—Soybeans make good grazing for hogs.

ower and, after drying, be thrashed out with a grain thrasher or with corn shredder. Even this latter method, with beans yielding 25 bushels er acre, the cost need not exceed 7 to 8 cents per bushel for cutting, ying, hauling, shredding, fanning, etc. This is about double what e cost would be with a bean harvester. Again, the peanuts are much ore exacting in their requirements when planted on a piece of land an are soybeans. This is true particularly with varieties of the Virnia type. Soybeans at $1.00 to $1.50 per bushel are decidedly more ofitable to the farmer than peanuts ranging in price from 70 cents $1.00 per bushel.

Soybeans also will make much more growth per acre. If both the ans and peanuts are inoculated, the total amount of humus and

nitrogen added by a crop of soybeans will be almost double the quantity afforded by a crop of peanuts, if the vines and roots of both are returned. Too frequently this is not the case with peanuts.

It must not be inferred from the above statements that soybeans are advocated to replace cowpeas or peanuts, for, as a matter of fact, this is not the idea. It must not be inferred, either, that soybeans have all

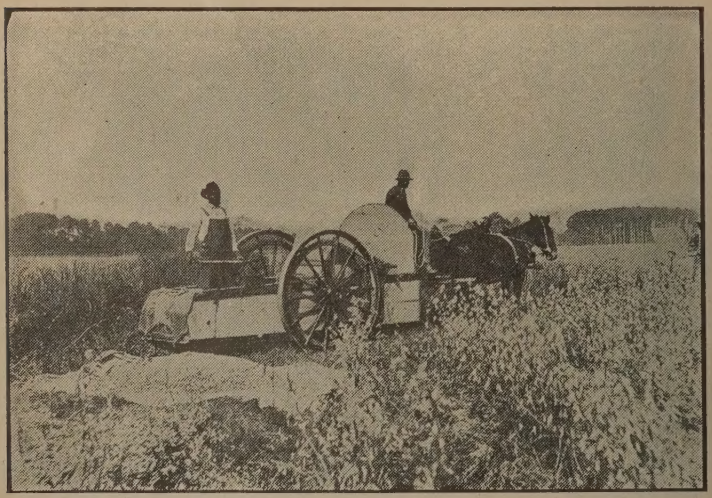

FIG. 4.—Harvesting soybeans from standing stalks in the field for seed and crushing purposes.

the advantages, for such an inference would not be substantiated by facts. It is believed that the acreage of all these crops might be materially increased to the advantage of many North Carolina farmers, and some of the advantages of soybeans over these other crops, when grown under our conditions, are pointed out. There is no question but that the acreage devoted to all three of these will be greatly augmented within the State during coming years.

SOYBEANS FOR THE IMPROVEMENT OF THE SOIL.

From the standpoint of the North Carolina farmer, it should be kept clearly in mind that in the growing of leguminous crops of all kinds, the primary object should be, as nearly as possible, to utilize these crops as largely as possible for soil-improving purposes. In order that

hey may be of the greatest service along these lines, it will be necessary hat as nearly as practicable most of the crops and their residues should go back into the soil for its enrichment. There is no question but what wo of the greatest needs for most of the North Carolina soils are humus and nitrogen, and in order to provide these in the soil, in the most economical way, under average farm conditions, it will usually be

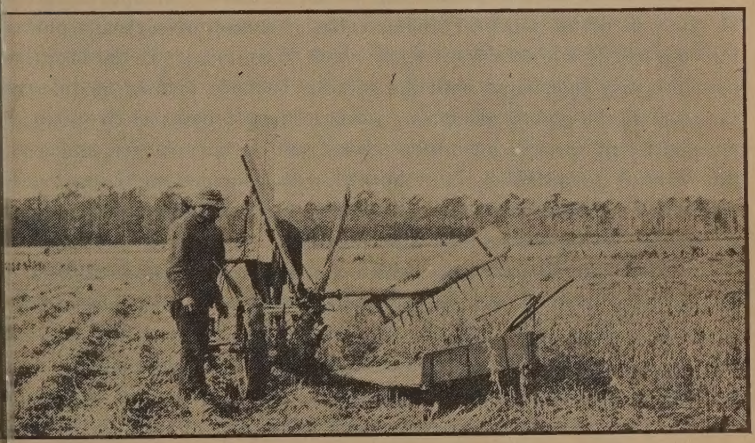

Fig. 5.—Harvesting soybeans with grain reaper for seed and for crushing.

und that the turning under of leguminous crops and crop residues is be more generally encouraged. There is no reason, however, in many ses why the seed should not be harvested or utilized in other ways, d the leaves, stems and roots of the soybean crops go back into the il for its improvement, particularly so where the price of seed is suffi-nt to justify the farmer in harvesting and disposing of the crop. Of urse, under all conditions, where practicable, the farmer should har-st enough seed to provide liberally for his own plantings and other eds.

Soybean vines, pound for pound, turned into the soil will addd to the l about the same amount of humus and nitrogen that are added by ner leguminous crops, such as cowpeas, vetch and clovers. It has n estimated that the value of the fertilizer constituents contained in rop of soybeans plowed into the soil in the green state would add to soil, fertilizing constituents to the value of $2.50 per ton; and as

there will be 6 to 10 tons of this material produced, the value of a good crop can be appreciated. In many cases the value of humus added will be of great direct value, as well as of indirect value, in that it will make conditions in the soil more favorable for plant growth. Again, the plant-food constituents contained in the soil will in many cases be enabled to exert more favorable influence in the production of the crops in rotation with the soybeans.

It may be of interest in this connection to know that approximately 80 per cent of the total fertilizing value of a crop of soybeans plowed into the soil is due to the nitrogen which it contains. If the crop has been properly inoculated with the suitable bacteria to form nodules on the roots of the plants, about two-thirds to three-fourths of the nitrogen the plant contains will have been taken from the atmosphere, and when the plant is turned back into the soil will be added to the potential plant-food contained therein. This will be in a readily available form as soon as decomposition has taken place.

In order that farmers may utilize the soybean to best advantage, it should be planned, as nearly as practicable, to have it in most of the rotations used on their farms in the production of cotton and corn and other suitable crops for North Carolina conditions. Soybeans in most sections of the State outside of the more elevated portions of the mountains may be grown to completed growth when planted after the harvesting of small-grain crops. If the land can be broken and otherwise put in proper shape for seeding immediately after harvesting the grain crop, this is particularly true.

SOYBEANS FOR FEED FOR LIVE STOCK.

On every farm there is more or less work and other live stock for which the farmer must provide feed. For grazing purposes, soybeans have great value, especially for hogs. As a hay crop, when properly fed, soybeans may be utilized to good advantage. The hay is a little coarse, but stock usually are very fond of it. It contains about the same amount of protein that is contained in alfalfa hay. The beans are rich in food nutrients, and for this reason, when properly fed, they may be used to good advantage in many cases.

SOYBEANS FOR HUMAN CONSUMPTION.

There is no question but what there will be a greater utilization of the seed from this crop, before or after crushing, for human consump-

tion as the years go by and the acreage devoted to the crop is materially increased throughout the South. The beans, because of their high content of food nutrients, when properly prepared, make a very nutritious and appetizing food product.

To some extent, the beans are being used at the present time in the manufacture of high-grade pork and bean products, about one-half to three-fourths soybeans being used with one-half to one-fourth navy beans. We have recently had an opportunity to sample a brand of pork and beans with tomato sauce in which the proportion of soybeans to navy beans was as three to one. We say without hesitancy that these were of very good quality. There appears no good reason why the manufacture of pork and beans into which soybeans are used should not materially increase. The beans contain as much or more protein than navy beans and are much cheaper. As a matter of fact, during the present year, the price of navy beans bought at wholesale were three to four times as high per bushel as soybeans bought in the same way.

Soybean flour or meal, when properly prepared, may be used in the making of many nutritious breads. Such breads are claimed, with much apparent truth, to be especially adapted for invalids suffering with certain diseases and for small children.

UTILIZATION OF SOYBEANS BY COTTON OIL MILLS.

Since the appearance of the cotton-boll weevil into Texas and its steady progress northward and northeastward through the cotton-growing section of the United States, there has been felt that other oleoginous seeds must be secured to supplement cotton seed in order to maintain the present number of cotton oil mills of the South on even a fair paying basis even when managed by the most efficient business methods.

In casting about to determine what crops would seem to be suitable for this purpose, it has been found that peanuts, soybeans, and possibly sunflower, might be used, as they contain a goodly amount of commercial oil in their seeds. It might be of interest to know that neither velvet beans nor cowpeas could be hoped to be utilized for this purpose, the seed of velvet beans contain only about 6.6 per cent oil, and those of cowpeas will analyze, on an average, about 1.7 per cent.

Of the three crops mentioned as bearing seed containing a high content of oil, it appears that soybeans are to be largely depended upon

by oil mill men. It is estimated that farmers will be able to get more profit per acre from a crop of soybeans than from a crop of cowpeas, and at the same time have a larger amount of material to turn back into the soil for its improvement. As a matter of fact, the peanut crop as handled at present is a soil-exhausting crop, rather than a soil-improving crop, because in most cases the vines are removed, and in many instances they have never found their way back, directly or indirectly, to the soil on which the crop was grown.

It is estimated that, on an average, it would cost 75 to 100 per cent more to grow and harvest a crop of peanuts than a crop of soybeans. Soybeans also have a much wider soil and climatic adaptation than do peanuts, and in order for the oil mills to depend upon a crop, generally, it must be grown very widely throughout the whole cotton-growing area of the South. Soybeans is a crop that has such possibilities. Soybeans, too, can be milled at much less cost than either peanuts or cotton seed. From information available, it would appear that the operation on soybeans at an oil mill properly equipped need not exceed two-thirds of the cost of operating on cotton seed.

It is not believed that soybeans are to replace cotton seed at the Southern cotton oil mills, but they might be used to supplement the cotton seed, and thereby prolong the short operating season of the mills, provided the oil mills are in a position to give to the farmer a sufficiently satisfactory price for his beans to justify him in selling to the mills. Of course, the price the oil mills will be able to pay will be governed largely by the price at which they will be able to dispose of their soybean meal and oil and the efficiency with which the milling operations are conducted. On the other hand, if the mills are not able to offer the farmer sufficiently attractive prices for his beans to secure them the farmer himself will be none the worse off for having produced the crop, as the crop itself may be used for soil improving or feeding purposes. This would not be the case with a crop of sunflowers.

PRODUCTS SECURED BY OIL MILLS IN CRUSHING SOYBEANS.

From a ton of soybeans, oil mills are able to secure from 32 to 35 gallons of oil and about 1,650 pounds of meal. There is a loss from cleaning and from evaporation of moisture in the milling operation of about 120 pounds per ton.

The meal contains about 30 per cent more nitrogen than cotton-seed
ıeal. The amounts of phosphoric acid and potash in the meal will
sually range about 1.4 and 1.8 per cent, respectively. From the analy-
s, there seems to be no logical reason why soybean meal should not
ell for a slightly higher price per ton than average cotton-seed meal
or fertilizing purposes. It will probably be demonstrated, also, that
ıe soybean meal will have a higher feeding value and will probably
found to have wider usefulness for feeding to different kinds of live
ock than cotton-seed meal.

Soybean oil has at the present time wide usefulness in the manufac-
ıre of soaps, paints, varnishes, enamels, japans, linoleums, oil cloth
ıd other water-proofing materials, asphaltums, salad oils, and other
ıman foods. Therefore, it seems that there is an assured market for
oth the meal and the oil.

Numbers of inquiries have been received from other States with refer-
ce to where soybean meal might be secured. Most of these inquiries
.ve come from people who were feeding live stock of some kind or
re interested in securing feed for feeders as stated in the letters of
quiry. To appreciate the importance of the oil at the present time,
is only necessary to call attention to the importation into the country
ring the year ending July 1, 1917, about $19,000,000 worth from
ental ports, calculating the price of oil at the present selling price.
an, farmers, canners, packers, and oil mill owners have a most prom-
There seems to be no reason, therefore, why North Carolina and
ıer Southern farmers and cotton oil mill owners should not profit by
industry required to meet these pressing demands for the meal and
. Taking everything into consideration, it appears that in the soy-
ın farmers, canners, packers, and oil mill owners have a most prom-
ng crop adapted for growth over the South. It can be utilized in
h a way as to build up the fertility of the soil and at the same time
l materially in revenue to finance the other farming operations.

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C. State College of Agriculture and Engineering, N. C. State Department of Agriculture, N. C. Experiment Station, and United States Department of Agriculture, Cooperating.

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Food Production Campaign For North Carolina

The National food situation is serious; the Southern food situation is ost serious. For North Carolina not to at least feed herself, would t only be a reflection, but a national calamity. It might even mean ach personal privation because of inability of transportation to bring od to us, no matter how plentiful elsewhere. North Carolina must ed herself and have some to spare so as to be a national asset and not national liability as to food.

That there may be no serious privation in our homes; that transpor- ion may be given first consideration in connection with our military eds, and not in bringing food to us; and that the surplus produced else- ere may go direct to the support of our Army and Navy, and those our Allies and the needs of their civil population, are the strong asons spurring us to do our part. To accomplish this will require reful thought, planning, and action.

In connection with the program asking farmers to volunteer to do eir part in this movement to "feed ourselves and have some to spare," e following suggestions are made covering the main crops and animals r the State.

ORN.—The production of corn must, by all means, be kept up to last year, and increased by ten or more per cent where possible, by increasing acreage, giving better preparation, cultivation, seed, and fertilization so as to increase acre yields, depending largely on increased yields: it does not pay to cultivate land producing less than 20 bushels of corn

per acre. Last year was a specially favorable corn season. Extra care and effort will be needed this year to increase the total production of last year. An abundance of corn is essential for human food and for live stock.

SMALL GRAINS (Wheat, Oats, and Rye).—These crops for the spring are already out, and every means should be followed to make the yields as large as possible and to harvest the crops in good condition, and follow with peas or soja beans for forage or soil improvement.

FORAGE AND HAY CROPS.—Grasses and clovers, soy beans, cow peas, velvet beans, etc., should be planned for, to furnish a plentiful supply of roughage for all farm and town animals, and some to spare for sections that may be short and for the Army. The live stock industry cannot be developed without an abundance of forage.

PEANUTS AND SOY BEANS.—Soy beans and peanuts should be grown on larger acreages than heretofore because of their great value as human and stock foods and sources of urgently needed vegetable oils. The acreage of soy beans particularly, should be increased ten to twenty per cent.

COW PEAS.—Cow peas should be grown in at least usual acreages for the dried peas for human food, or hay for live stock or for soil improvement.

VELVET BEANS.—The great value of this crop for soil improvement and live stock justifies a largely extended acreage over previous years. It can be planted and cultivated with very little additional labor.

SORGHUM.—The sorghum crop should be largely increased by the planting of small areas on many farms, for producing syrup for the family and for those who cannot grow or have syrup made, and for the people in the towns. The scarcity of sugar and other sweets will make this urgent and profitable. Sorghum is also a productive and valuable forage for stock.

SWEET POTATOES.—Sweet potatoes should be grown in as large quantities as possible and plans made in advance for storing so as to keep with a little loss from rotting as possible. Storage houses can be built for this purpose at little cost.

HOME GARDENS.—A home garden for not only every farm, but for every town family, with plenty of vegetables during the growing season and to be put up to meet the needs for the entire year, should be provided.

ORCHARDS.—The orchard should be handled to the limit for fruit for the family, for sale and for canning and drying. Don't forget to spray.

.—North Carolina is asked by the Government to increase its produc-
on of pork 15 per cent. This means an addition of 200,000 to the hog
pulation. The increase last year was 38,687. Make plans to produce
ough hogs to supply meat for the country and the towns, for our sol-
ers, and some to spare for our Allies. Hog pastures and corn are
cessary for this. Prepare for it in planning your crops this year.

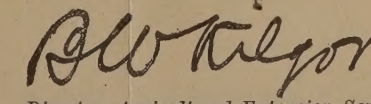
LY COWS.—At least one good milk cow, and better two or more,
ould be provided for each farm family in addition to providing for the
pply of milk and butter for the towns. Pasture, roughage, and
-product feeds are required for the successful handling of cattle.

TRY.—The stock of poultry in the country is the smallest ever known
cause of the large demand and the high price of feeds. The stock of
ultry must be increased and handled so as to get the most out of it.
eserve eggs now while they are cheap for use next winter. A good
ethod is to put them up in waterglass solution. One part waterglass
9 or 10 of water is a good proportion.

P.—Don't forget the State program to greatly increase sheep growing
r clothing and meat and profit, and soil improvement.

ON.—Cotton is necessary for clothing, oil, and feed for stock. One
shel of cotton seed contains about 6 pounds of oil (Be sure to have
ed crushed and the oil utilized). Keep the area of cotton about nor-
al, or reduce it where necessary to produce a sure supply of food and
ed crops, and increase the acre yield by better preparation, cultivation,
d fertilization, and thus make the profit on our main money crop
ger.

men and women county agents and all the other workers in the
s lines of the Agricultural Extension Service of the North Caro-
tate College of Agriculture and Engineering and the State and
l Departments of Agriculture are putting all their efforts into
ovement and will give assistance wherever needed.



Director, Agricultural Extension Service.